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IRRIGATION AND WATER SUPPLY COMMISSION
QUEENSLAND

REPORT

ON

St. George Irrigation Project

by

W. H. R. NIMMO
M.C.E., M.I.C.E., M.Am.Soc.C.E., M.I.E.Aust.,
Commissioner of Irrigation and Water Supply

July
1953

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE :
BY AUTHORITY : A. H. TUCKER, GOVERNMENT PRINTER.

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Irrigation and Water Supply Commission,
Brisbane, 10th August, 1953.

MEMORANDUM FOR :

THE HON. THE MINISTER FOR LANDS AND IRRIGATION.

PROPOSED ST. GEORGE IRRIGATION PROJECT.

I submit herewith a report upon the proposed St. George Irrigation Project, a scheme which represents the first attempt to bring the benefits of irrigation to the western area of the State.

Although not of great extent, the value of production from each farm should provide a satisfactory return to the settler. If carried to completion of the second stage, involving the establishment of 37 farms, the annual revenue is expected to meet the cost of operation, maintenance, and administration, and the total value of production will represent a fair indirect return to the State upon the capital invested.

An amount of £55,000 has been provided for this project in the schedule of loan expenditure for 1953-54, and, subject to approval by the Government, work may be commenced immediately.

If the project is commenced, construction should be carried out continuously to completion of the second stage (37 farms), at a total expenditure of £431,000, spread over the years 1953-54 to 1956-57.

It will be necessary for the St. George Irrigation Undertaking to be established by approval of the Legislative Assembly, as required in section 7 of the Irrigation Acts.

The information required under section 7 of the Irrigation Acts is contained in Part II. of the report (General Report and Description of Project), and is summarised in Table A on page 3 of the report.

W. H. de Vries.

M.C.E., M.I.C.E., M.Am.Soc.C.E., M.I.E.Aust.,

Commissioner of Irrigation and Water Supply.

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IRRIGATION AND WATER SUPPLY COMMISSION—QUEENSLAND.

REPORT ON ST. GEORGE IRRIGATION PROJECT.

SUMMARY AND RECOMMENDATIONS.

Purpose of Project.

In the western portions of the State there are many areas, having suitable soil, where the rainfall is insufficient for intensive cultivation, and the possibility of irrigation has long been contemplated. The topography of the country precludes the construction of large storage reservoirs, so that irrigation must necessarily be limited to small projects subject to the economic disadvantages usually associated with small enterprises.

As early as 1889 it had been proposed to conserve water by building a series of weirs on the Balonne River between Dalby and St. George, but this idea was abandoned when surveys showed that only very small storages, not exceeding 2,000 acre feet, could be constructed along that section of the stream.

The greater width of the stream in the vicinity of St. George presented more favourable conditions for storages which moreover would impound the waters of both the Balonne and the Maranoa Rivers. During the last thirty years, a number of irrigation schemes have been proposed and these are enumerated in Part I. of this report.

Weir at St. George.

There has recently been completed at St. George a combined concrete bridge and weir—the Jack Taylor Weir—for the primary purposes of providing a road crossing of the Balonne River and a water supply for the town. The weir, which has a maximum height above the stream bed of 18 feet, impounds 3,900 acre feet of water, which is far in excess of that required for water supply to the town. Provision has been made for the installation of sluice gates upon the crest of the weir to raise the water level by 4 feet and increase the storage to 6,400 acre feet. Some strengthening of the weir will permit of raising the water level by a further 2 feet, thus increasing the storage to 7,450 acre feet.

Without practical experience with small isolated irrigation areas in the drier parts of the State, the building of a large weir with the intention of using the surplus water for irrigation was, as stated by the then Premier, the late Hon. E. M. Hanlon, M.L.A., at the inaugural ceremony on 28th April, 1948, somewhat of an experiment to discover to what extent the benefits of irrigation can be brought to the west.

The Proposed Project.

Description.

The area to be irrigated is shown red on Plan No. 2, and water pumped from the reservoir near the weir will be conveyed to it by an open channel, from which it will be distributed by gravity in smaller channels to the farms to be watered. Having regard to topography, soils, the height to which water must be pumped, and transport, the area selected is more favourably located than any other area adjacent to St. George. A drainage system will be constructed to remove both storm water and any surplus water from irrigation.

The area will be served by the Thallon-St. George main road, which traverses it, but access to farms will be by roads constructed to pioneer standard. Provision has been made also for the necessary administrative accommodation.

The proposed project is described in more detail in the following parts of this report.

Stage Construction.

The irrigation area will be developed in two stages. The first stage, comprising 17 farms, will correspond to the quantity of water available from the existing weir.

The second stage cannot be undertaken until the storage capacity of the weir is increased by installing sluice gates on the crest, but either of two alternatives may be adopted for this second stage, viz.—

- (a) Crest gates 4 feet high and 12 additional farms ; or
- (b) Crest gates 6 feet high and 20 additional farms.

If construction of Stage 1 be commenced during 1953-54, then to maintain continuity in construction, Stage 2 should be started in 1955-56. Decision as to the adoption of Stage 2a or 2b or either of them need not be made immediately, but the pump well and main channel will be built at the outset of sufficient capacity for Stage 2b.

Land Usage.

The gross area of each farm has been fixed at 300 acres and each farm will be allotted a water right of 140 acre feet per year, but in normal years, when full supply is available, a farmer will be permitted to purchase an additional 30 per cent.—that is, 42 acre feet—at the same price per acre foot, thus bringing his total supply up to 182 acre feet for the year.

In consultation with the Department of Agriculture and Stock, careful consideration has been given to the most suitable type of farming. A settler will be free to grow whatever crops he pleases, but it has been assumed for the purpose of this report that farms will be developed initially upon a cotton-fodder basis with wheat and a few sheep as a sideline. The water available in normal years will suffice for 40 acres of cotton and 42 acres of perennial pasture and also permit one irrigation of fallow for 100 acres of wheat.

Although the cotton-fodder combination appears to offer the better return, especially until settlers become well established, it must be borne in mind that St. George is in a sheep-raising area and it is anticipated that settlers may successfully change over to fat lamb and wool production.

The number of farms available upon completion of each stage of the project and the estimated production therefrom are set out in Table A.

Economics of Project.

The total cost of the weir was £120,000, but portion of this would have had to be expended to provide a water supply for St. George. The additional expenditure due to raising the weir for irrigation is estimated to be £45,000. Since this expenditure has already been incurred, it has not been taken into account in examining the economics of the new project.

The estimated capital expenditure, annual expenditure on operation, maintenance, and management, and revenue at the completion of each stage of the project is given in Table A. The estimate of revenue has been based upon a water right charge at the rate of £2 per acre foot delivered to the farm ; an annual drainage rate of 7s. per acre ; and an annual land rental at the rate of 2s. 6d. per acre. It is now the usual practice in financing irrigation schemes to assume that the capital cost of bringing water to the farm boundaries shall be borne by the State, but the annual cost of operation, maintenance, and management should be met out of revenue. The annual charges include the cost of pumping from the weir as well as that of operating and maintaining the channels and other irrigation works. It is evident from Table A that Stage 1 and the larger alternative Stage 2b must be carried out before revenue can be expected to meet annual charges. Moreover it is anticipated that for the first year only one-third and for the second year two-thirds of the normal water right charge can be imposed upon a settler, so there will be a lag in revenue resulting in an accumulated deficit which will not be extinguished until the twelfth year of operation.

It has been estimated that in Victoria two-fifths of the value of increased production accrues to the Commonwealth and State Governments directly as water and drainage charges and indirectly in fares, freights, and other charges. Assuming that similar conditions obtain in Queensland and that the indirect return to the State Government is one-fifth of the value of increased production, it represents a return upon capital invested of 11.5 per cent. upon completion of Stage 2b.

Further Development.

Further development is possible by building another weir at the 13 Mile Rocks upstream from St. George. From this point it is possible to convey water by gravity to irrigate land adjacent to that included in the project now proposed. More surveys and investigations will be necessary to determine whether such further development is economically feasible.

Cost of Establishing Farms and Returns Therefrom.

The project appears to be a good one for a satisfactory settler who has not less than £2,000 to start with. The maximum amount which he will require to borrow in the third year will then be well within the £7,500 which the Agricultural Bank is empowered to advance.

Allowing for light crops of wheat and cotton one year in ten, it is anticipated that at the end of ten years he will accumulate assets to the value of about £8,000 after providing for a continuous living allowance at the rate of £520 per annum.

Recommendations.

Subject to approval by the Government of the establishment of an irrigation area near St. George to be supplied with water from the recently completed weir, it is recommended that—

- (1) The proposals for establishment of the St. George Irrigation Undertaking, details of which are set out in Part II. of this report, be submitted to the Legislative Assembly for approval ;
- (2) The St. George Irrigation Project, comprising both Stages 1 and 2*b*, as described in this report, be constructed at an estimated cost of £431,000 for pumping plant, irrigation works, and drainage system, including £45,000 for raising the storage level in the Jack Taylor Weir ;
- (3) Construction of Stages 1 and 2*b* be continuous ;
- (4) Subject to the approval of the Legislative Assembly to the establishment of the Irrigation Undertaking, the constitution under the Irrigation Acts of an irrigation area, and under the Water Acts a drainage area of approximately 26,000 acres as set out on Plan No. 5 attached to this report be proceeded with ;
- (5) Investigation of further schemes for conservation of water on the Balonne River for the purpose of extending the irrigation area be proceeded with.

W. H. de Nimmro.

M.C.E., M.I.C.E., M.Am.Soc.C.E., M.I.E. Aust.,

Commissioner of Irrigation and Water Supply.

TABLE A.

	Stages 1 and 2.		
	Stage 1.	Alternative. <i>a</i>	Alternative. <i>b</i>
<i>Storage—</i>			
Total storage capacity at weir, acre feet	3,900	6,140	7,450
Total cost of weir	£120,000	£145,000	£165,000
Cost of storage per acre foot (approximately)	£31	£24	£22
Portion of storage capacity available for irrigation, acre feet ..	3,500	5,440	6,750
Normal annual draft available for irrigation, acre feet ..	4,460	7,600	9,750
Normal annual supply available at farms, acre feet	3,122	5,320	6,820
<i>Farms—</i>			
Total number of farms	17	29	37
Average area per farm, acres	300	300	300
Gross area of all farms, acres	5,100	8,700	11,100
Maximum area irrigated annually, acres	3,094	5,278	6,734
Estimated value of increased production	£130,000	£223,000	£284,000
Water right per farm, acre feet per annum	140	140	140
Normal water supply per farm, water right plus 30 per cent. sales, acre feet per annum	182	182	182
<i>Capital Cost, Annual Expenditure, and Revenue—</i>			
Total capital expenditure, exclusive of weir already constructed ..	£239,500	£352,000	£431,000
Capital expenditure per acre of farms	47-0	40-4	38-8
Annual cost of operation, maintenance, and administration after completion of each storage	£9,100	£14,620	£17,113
Annual revenue from rent, water right, and drainage charges ..	£8,260	£14,070	£17,953
Excess of annual expenditure over revenue	£840	£550	..
Excess of revenue over annual expenditure	£840
Annual indirect return to State, assumed to be 20 per cent. of increased value of production, less direct charges for water and drainage	£22,500	£38,000	£49,000
Annual indirect return to State as percentage of capital expenditure on irrigation works	9-4%	11%	11-5%

PART I.—HISTORICAL.

As early as 1889 it was proposed to conserve water by constructing a series of weirs on the Balonne River between Dalby and St. George, but this proposal was abandoned after surveys had shown that only small storages, not exceeding 2,000 acre feet, could be constructed along that section of the stream.

The greater width of the channel in the vicinity of St. George offered more favourable conditions for storages which would impound the waters of both the Balonne and Maranoa Rivers, having a combined catchment area of 27,000 square miles.

Irrigation in the St. George district was contemplated at least as early as 1922, when B. E. Shaw, Assistant Engineer, Hydraulic Engineer's Department, carried out an investigation and selected three possible sites for weirs (Plan No. 2), viz.—

- A—at 144.26 miles at the rocks immediately above the town;
- B—at 151.45 miles at the 8 Mile Rocks;
- C—at 156.42 miles at the 13 Mile Rocks.

A relatively rapid rise in the bed of the stream for some miles upstream of B renders that site unfavourable for storage compared with sites A and C, though it would be suitable for a high diversion weir.

Of six schemes outlined in the 1922 report, one (No. 4) provided for irrigation by pumping to land along the left bank of the river above St. George and the other five involved diversion of water by gravity or pumping to Thuraggi Lagoon, from whence it would be distributed to the area of land shown green on Plan No. 2.

Further consideration of these schemes was deferred until more information regarding stream flow became available. A stream-gauging station was established at St. George in 1921 and an evaporation gauge was installed in 1925.

In another report in 1930, Mr. Shaw advocated abandoning former proposals for diversion entirely by gravity either directly from a weir at C or from a diversion weir at B because they would not permit of using water stored by a weir at A and the Shire Council desired that any weir built should be sufficiently close to St. George to provide a water supply for the town. The proposals were thus reduced to two, viz.—

- No. 3—comprising weirs at A and C; a pumping plant at P delivering water through a channel about two miles long to Thuraggi Lagoon; a regulator on Thuraggi Lagoon providing a small additional storage; and supply thence by gravitation to the area shown green on Plan No. 2;
- No. 4—comprising a pumping plant at P delivering water to a channel running parallel to the river for a distance of $4\frac{1}{2}$ miles and supplying water by gravitation to all allotments close to the river bank in the area shown yellow on Plan No. 2.

The land to be irrigated under Scheme No. 4 would be the lighter levee soils, which have good drainage and are well suited for citrus or other crops, but is mostly freehold involving high cost of resumption and resubdivision.

Mr. Shaw advocated adoption of Scheme No. 3, because much of the area was leasehold and the land was considered to be suitable for lucerne and other crops.

There appears to have been no further action until about 1945, when the Balonne Shire Council, realising the necessity of providing a water supply for the Town of St. George and replacing the existing timber road bridge across the Balonne, engaged the services of Mr. J. Mulholland, Consulting Engineer, who submitted a report (1946) proposing a combined weir and bridge at 142.6 miles almost immediately upstream of the existing timber bridge. His proposal included the alternatives of a weir 11 feet high to provide for town supply only or a weir 18 feet high intended to impound some water for irrigation also. The Council pressed for the adoption of this site, notwithstanding that the level of the stream bed was eight feet lower than at site A, because it was a convenient place for the road crossing and providing a permanent lake in front of the town, even though there may be some pollution by drainage therefrom. Subsequent surveys showed that, for the same crest level, a weir at the new site compared favourably with respect to storage capacity with one at site A. As a result of discussion between the Co-ordinator-General of Public Works and the parties interested, it was decided to build a combined weir and bridge at the 142.4 mile site.

The weir has now been built at the 142.6 mile site by the Irrigation and Water Supply Commission to a design prepared by it. In its present condition the weir has a maximum height above the stream bed of 18 feet and impounds 3,900 acre feet of water. It will be possible to increase the storage capacity to 7,450 acre feet by the installation of movable crest gates which will raise the pond level by six feet.

There was not available any satisfactory experience upon which to base an investigation into the economics of small isolated irrigation areas in the drier parts of the State, and as stated by the then Premier, the Honourable E. M. Hanlon, M.L.A., at the inaugural ceremony on 28th April, 1948, the building of the weir—the first of its kind in the west—was somewhat of an experiment to discover to what extent the benefits of irrigation can be brought to the west.

A 1951 proposal for utilising the water to be stored by this weir was to irrigate an area of land adjacent to the left bank of the Balonne River, immediately north and east of St. George, shown edged black on Plan No. 2. Water was to be raised by electrically-driven pumps, situated approximately at X on Plan No. 2, supplied with energy from a central power station to be installed by the Balonne Shire Council. The high pumping head involved in delivering water to these levee soils, together with high cost for resumption and resubdivision, would make it necessary to grow high-priced crops, the principal crop being tobacco. Because of isolation from other tobacco areas and varying labour requirements, it was considered that the St. George area is not a suitable location for a project based upon tobacco.

A soil reconnaissance of the area (Plan No. 4) to the south-east of St. George showed that the land is suited for production under irrigation of irrigated pastures for fat lamb, wool, and fodder, and sufficient area is available for the larger farms necessary for such development. Moreover, the site adopted for the weir permits of locating the pumping station at the southern end of St. George, where the height to which the water must be lifted is less than that for the former proposal. This is the area which it is now proposed to develop, but economic studies indicate that cotton-growing should be combined with the production of fat lambs and fodder.

PART II.—GENERAL REPORT AND DESCRIPTION OF PROJECT.

As a result of investigations of methods of utilising the water available from the weir, now complete except for possible future installation of crest gates, this report has been prepared and includes proposals for—

- (1) The establishment of an irrigation undertaking in the St. George area to serve the area shown coloured on Plan No. 5 ;
- (2) The construction of irrigation and drainage works comprising Stage 1 of the undertaking, to serve an area of some 5,100 acres subdivided to 17 farms ; and following the preparation of detailed designs and estimates to proceed with development of Stage 2 of the undertaking comprising the installation of crest gates on the weir and the extension of irrigation and drainage works to serve a further area of not more than 6,000 acres comprising a further 20 farms ;
- (3) The constitution of an Irrigation Area under the Irrigation Acts and a Drainage Area under the Water Acts, as indicated on Plan No. 5 ;
- (4) Arrangements to be made with the St. George Electricity Authority for supply of electric power to the proposed pumping station ;
- (5) Investigation of further water conservation works on the Balonne River and irrigation works in the St. George area.

Information Available.

Detailed designs and estimates have been prepared for the irrigation, drainage, and other works for Stage 1 of the project and preliminary estimates for the alternative Stage 2 developments.

Detailed designs and estimates of Stage 2 development will be proceeded with at an early date.

Details of the Proposed Project.*

(a) Boundaries and Extent of Area.

A map (Plan No. 5) shows the boundaries and extent of the lands proposed to be included in the irrigation area and served by the irrigation undertaking.

(b) Description and Purpose of Works.

The project comprises—

- (1) Utilisation of water available from the existing weir, installation of a pumping station on the left bank of the Balonne River adjacent to the weir, and the construction of main and distributory channel systems to convey water from the pumping station to lands in the area shown on Plan No. 5 ;
- (2) Construction of drainage works to serve farms in the area for removal of storm runoff, and surplus irrigation water. The effect of these works will be to safeguard the irrigated lands from soil deterioration due to excessive soil moisture, and thus protect assets created in the water conservation, irrigation, and farm development works ;
- (3) Construction of roads to reasonable pioneer standards to serve the farms to be opened in the area ;
- (4) Office and staff accommodation as required in the area to provide for satisfactory administration and management of the project ;

* Information under this heading is set out in the form required by " *The Irrigation Acts, 1922 to 1949.* "

(5) Development of all of the above works in two stages comprising—

Stage 1—

Utilisation of water available from the weir, with its present capacity of 3,900 acre feet, to permit the development of 17 farms with a total area of 5,100 acres, shown red on Plan No. 5;

Stage 2—

Increasing the storage capacity of the existing weir to not more than 7,450 acre feet by the installation of crest gates and extension of the irrigation, drainage, and other works to serve not more than a further 20 farms of 6,000 acres, making the maximum development 37 farms of 11,100 acres. The approximate area to be developed in Stage 2 is shown coloured green on Plan No. 5. Stage 2 may be either of two alternatives depending on whether the weir is raised (a) 4 feet or (b) 6 feet.

(c) Nature and Extent of Works.

Stage 1—

Irrigation works will consist of an electrically-driven pumping plant with a capacity of 22 cubic feet per second situated on the Balonne River upstream of the existing weir, which will raise water from the weir pool to the main channel shown on Plan No. 5. The main channel will convey water from the pumping station a distance of 6 miles to the area to be developed from where it will be reticulated by a system of some 10 miles of distributary channels through the area, indicated on Plan No. 5.

Channels will be constructed so that water will flow by gravity on to the farms, no further pumping being required. All channels will be open trapezoidal-shaped earth channels, in some cases lined with clay to reduce losses by seepage where channels pass through sandy soils, and with necessary reinforced concrete regulators, outlets, and culverts to provide for control of water and access across channels. Water delivered to farms will pass through Dethridge meters which will measure all water supplied.

Drainage works will consist of 7 miles of open earth channels, located and constructed to collect and remove surplus storm and irrigation water. Reinforced concrete structures for access across drains, prevention of scour at inlets, junctions, and drops in drains will be incorporated where required.

Ancillary works, following upon acquisition and subdivision of land, will be layout and construction of roads through the area and provision of necessary office and staff accommodation for the management and operation of the area.

Stage 2—

Increasing the capacity of the existing weir to 7,450 acre feet by the installation of crest gates. Irrigation, drainage, and ancillary works will be extensions to Stage 1 works located in the area shown green on Plan No. 5.

The capacity of the pumping station plant will be increased to 41 cubic feet per second.

(d) Estimates of Cost.

(i.) Estimate of Total Cost—

The estimated total capital cost of the project, based on costs as at 1st March, 1953, together with the area and costs per acre served at any stage are as set out in Table 1.

TABLE 1.
CAPITAL COSTS—STAGES 1 AND 2.

Stage.	Item.	Capital Cost.	Area Served.	Cost per Acre Served.
		£	Acres.	£
1	Irrigation works, including power installation costs ..	157,500	5,100	30.9
	Drainage works	31,000	..	6.1
	Surveys, land resumptions, road works, office and staff accommodation	51,000	..	10.0
		239,500	5,100	47.0
1 and 2a ..	Installation of crest gates, Jack Taylor Weir	25,000	..	2.8
	Irrigation works, including power installation	185,000	8,700	21.3
	Drainage works	53,000	..	6.1
	Surveys, land resumptions, road works, office and staff accommodation	89,000	..	10.2
		352,000	8,700	40.4
1 and 2b ..	Installation of crest gates, Jack Taylor Weir	45,000	..	4.0
	Irrigation works, including power installation	209,000	11,100	18.9
	Drainage works	68,000	..	6.1
	Surveys, land resumptions, road works, office and staff accommodation	109,000	..	9.8
		431,000	11,100	38.8

ST. GEORGE REPORT.

CORRIGENDA :

Page 6—Line eleven.

Delete words “coloured green”.

Page 8—Second last paragraph second line.

Delete word “an”.

The actual cost of the existing weir without crest gates is £120,000, which, if added to the above costs, brings the total cost to £359,500, £472,000, and £551,000 and the cost per acre served to £70, £54.3, and £49.6 respectively.

(ii.) Estimated Annual Costs of Operation, Maintenance, and Management—

The estimated costs of operation, maintenance, and management of the project, including drainage works after full development of each stage, exclusive of interest and redemption charges on the capital costs, together with an estimate of annual revenue, are set out in Table 2.

(e) Estimate of Annual Revenue.

The revenue from the project will be derived from water right charges, charges for water supplied in excess of water rights, drainage charges, and rentals of land within the irrigation area. In preparing the estimates of annual revenue the following charges have been adopted :—

Water—£2 per acre foot for water supplied as water right and as water sales.

Drainage—7s. per acre drained per annum.

Land Rental—2s. 6d. per acre per annum.

TABLE 2.

ESTIMATED ANNUAL COSTS OF OPERATION, MAINTENANCE, AND MANAGEMENT AND REVENUE.

Stage.	Operation, maintenance, and management.			Revenue.				Excess cost of operation and management over revenue.	Excess of revenue over cost of operation and management.
	Irrigation works.	Drainage works.	Total.	Water charges.	Drainage charges.	Land rental.	Total.		
	£	£	£	£	£	£	£	£	£
1	6,960	2,140	9,100	5,840	1,785	635	8,260	840	..
1 and 2a	11,970	2,650	14,620	9,940	3,045	1,085	14,070	550	..
1 and 2b	13,580	3,533	17,113	12,680	3,885	1,388	17,953	..	840

As indicated in Table 2 above, it is estimated that annual costs will exceed revenue by £550 for Stages 1 and 2a, whilst revenue will exceed annual costs by £840 for Stages 1 and 2b.

It is proposed (see page 16 of the report) that to assist settlers during the first three years of the development of the project that charges for water be—

First Year—One-third of water right charge or charge for the amount supplied, whichever is the greater.

Second Year—Two-thirds of water right charge or charge for the amount supplied, whichever is the greater.

In the case of Stages 1 and 2b, the loss of revenue resulting from this proposal amounts to £4,790 in the fourth year of development, but would be extinguished by the twelfth year. It is proposed that this loss in revenue be met from Consolidated Revenue.

(f) Amount of Money to be Advanced to the Commissioner as a Loan.

It is not proposed that any money be advanced to the Commissioner as a loan, for the construction of the project, but that the capital cost be met by annual appropriation by Parliament from Loan Funds as required. It is also proposed that the interest and redemption charges on the capital cost of the works shall be met from Consolidated Revenue and not charged to the Irrigation Area Trust Fund. Any surplus of revenue over operation, maintenance, and management costs may, unless required by the Commissioner for further construction works or replacement of works or for payment to a Reserve Fund, be paid to the Treasury as a contribution towards interest and redemption charges.

(g) Quantity of Water to be made Available for Irrigation.

The quantity of water to be made available for irrigation in normal and dry years from the storage capacity available in the Jack Taylor Weir at each stage of development, together with the quantity of water available at farms and the quantity of water to be allocated as water rights is estimated as set out in Table 3.

TABLE 3.
QUANTITY OF WATER TO BE MADE AVAILABLE FOR IRRIGATION.

	Storage capacity.	From storage.	At farms.	Allocated as water rights.
	Acre Feet.	Acre Feet.	Acre Feet.	Acre Feet.
1	3,900	2,380
Normal years	4,460	3,122	..
Dry years (1 in 30)	2,720	1,904	..
1 and 2a	6,140	4,060
Normal years	7,600	5,320	..
Dry years (1 in 30)	4,640	3,248	..
1 and 2b	7,450	5,250
Normal years	9,750	6,820	..
Dry years (1 in 30)	5,780	4,144	..

(h) Streams over which Commissioner should exercise control.

It is proposed that the Commissioner should exercise control over the Balonne River for the purpose of exercising control over the water supply in that stream, and for drawing water from that stream for supply to the area.

(i) Quantity of Irrigable Land to be Irrigated.

The area of land to be contained within the farms and classified as irrigable and the area that the water available will permit to be beneficially irrigated is set out in Table 4 hereunder.

TABLE 4.
QUANTITY OF IRRIGABLE LAND AND LAND TO BE IRRIGATED.

Stage.	Area of irrigable land.	Area of land to be irrigated annually.*
	Acres.	Acres.
1	5,100	3,094
1 and 2a	8,700	5,278
1 and 2b	11,100	6,734

NOTE.—* Includes 1,700 acres, 2,900 acres, and 3,700 acres for Stage 1, Stages 1 and 2a, and Stages 1 and 2b respectively, given one irrigation for wheat production.

(j) Description and Value of Irrigable Land.

For Stages 1 and 2b the resumption or acquiring and vesting in the Commissioner of up to 14,000 acres of land in the project area will be required to permit the resubdivision and development of the 11,100 acres of irrigable land as irrigation farms. The present tenure of the lands to be vested in the Commissioner is approximately 6,500 acres freehold and 7,500 acres grazing homestead lease, as shown on Plan No. 3. The value of the land to be resumed for resubdivision and settlement including improvements, is estimated to be £61,000.

For Stages 1 and 2a the area to be resumed will be 11,000 acres, the estimated value of which, including improvements, is £48,000.

(k) Benefits Resulting from the Development of the Project.

As indicated in paragraphs (e) and (f) above, it is proposed that any excess cost of operation, maintenance, and management over revenue and the interest and redemption charges on the capital costs of the works be met from Consolidated Revenue. This is considered to be justified by the indirect benefits and revenue that will result from development of the project by virtue of the value of increased production and the increased employment that will be created.

It has been estimated that in Victoria forty (40) per cent. of the value of increased production from an irrigation accrues to the Commonwealth and State Governments, either directly as water and drainage charges, or indirectly as fares, freights, and other charges. Estimates of the average value of production from the project area after full development and on the basis of cotton-fodder production farms will be—

For Stage 1—£130,000
For Stages 1 and 2a—£223,000
For Stages 1 and 2b—£284,000

This would provide for the total increased return to State and Commonwealth Governments, after deduction of water and drainage charges, of amounts of £44,000, £76,000, and £97,000, respectively, for Stages 1, 1 and 2a, and 1 and 2b, of which probably 50 per cent. will be received by the State. These amounts would provide a substantial surplus over the interest and redemption charges of £19,000, £25,000, and £29,000 for these stages respectively, and any excess of operation, maintenance, and management costs over revenue.

PART III.—WATER RESOURCES AND STORAGE.

Climate and Moisture Requirements.

Climatic conditions in the area are similar to those prevailing over most of Western Queensland. The rainfall is well distributed throughout the year and there is no well-defined monsoonal season, although the heavier monthly falls occur from January to March.

The average annual rainfall is 19·71 inches, distributed as set out in Table 5. The table also indicates the estimated mean plant requirements, based on 70 per cent. of pan evaporation, and moisture deficiency which must be approximately made up by irrigation.

TABLE 5.
AVERAGE RAINFALL AND MOISTURE REQUIREMENTS.

Month.	Estimated mean plant requirements.	Mean precipitation.	Estimated mean moisture deficiency.
	Inches.	Inches.	Inches.
January	7·28	2·60	4·68
February	6·09	2·41	3·68
March	5·67	2·07	3·60
April	3·99	1·25	2·74
May	2·59	1·37	1·22
June	1·68	1·48	0·20
July	1·68	1·31	0·37
August	2·45	0·95	1·50
September	3·85	1·09	2·76
October	5·53	1·36	4·17
November	6·30	1·78	4·52
December	7·00	2·04	4·96
Total	54·11	19·71	34·40

From the table it is apparent that the mean rainfall is insufficient to supply the estimated mean plant requirement during any month of the year and that the application of irrigation water is necessary if intensive agricultural development is to be obtained.

Storage.

The water supply for the area is to be obtained from the Jack Taylor Weir, on the Balonne River. Construction of this weir to Crest R.L. 630 with a storage of 3,900 acre feet has been completed with the exception of installation of sluice gates.

The design of the weir provides for an increase in storage capacity to 6,140 or 7,450 acre feet by fitting of steel gates 4 to 6 feet high on the crest of the weir.

Water Availability.

Using the estimated monthly percentages of irrigation demand given in Table 7, the water available from the storage in normal years has been determined and is set out in Table 6.

TABLE 6.
AVAILABILITY OF WATER—JACK TAYLOR WEIR.

Stage.	Storage.		Water available.	
	Crest R.L.	Capacity.	At pumping stations.	At farms.
		(Acro feet.)	(Acro feet.)	(Acro feet.)
1	630	3,900	4,460	3,122
1 and 2a	634	6,140	7,600	5,320
1 and 2b	636	7,450	9,750	6,820

During the 30 years of records, from 1922 to 1951, each farm in both stages would have been supplied with 182 acre feet (130 per cent. Water Rights) in 21 years, whilst only in 1923 would less than 140 acre feet (Water Right) have been supplied—in this particular year 112 acre feet (80 per cent. Water Right) would have been supplied. Only once during the period of records would less than 182 acre feet per farm have been supplied in more than two successive years—this would have occurred in 1930–32, during which period an average supply of 168 acre feet per farm could have been made. The estimated storage behaviour for Stages 1 and 2a is shown in Plan No. 6, and for Stages 1 and 2b on Plan No. 7.

In determining the water available for irrigation development, minimum storages of 400 and 700 acre feet for Stages 1 and 1 and 2 respectively have been allowed to satisfy water requirements for the town of St. George, private diversions for irrigation from the Weir pool, and riparian rights to landholders downstream of the weir.

PART IV.—SOILS, LAND USE, AND WATER REQUIREMENTS.

Location of Area.

After investigation of the land suitable for irrigation development on both banks of the Balonne River, it has been decided that development should take place on the left bank.

Objections to development on the right bank include—

- (1) The land adjacent to the weir is higher than on the left bank, thus requiring the water to be lifted to a greater height and so considerably increasing water charges.
- (2) To obtain the same pumping head and consequently the same operating charges as for the left bank the capital cost of the main channel would be much greater due to the necessity for constructing it in deep cutting and building a large number of structures. Construction at a lower level to avoid deep cutting would require costly flood protection works.
- (3) At times of high flood, overflow from the Maranoa River passes through the area.
- (4) The area is more heavily timbered and topography is not as satisfactory due to a large area of "melon-hole" country, and farm development costs would be greater.

Soil and Topography.

A preliminary soil survey of the area has been carried out by officers of the Bureau of Investigation and a preliminary topographical survey by officers of this Commission. Details of these surveys are shown on Plan No. 4. A detailed topographical survey of the area is now almost complete.

The predominant soil types are a dark-grey brown silty clay which cracks deeply and a self-mulching brown clay with occasional small patches of sand. In the main, the area is open grassland with light patches of coolibah and box timber.

The prevailing topography shows a general fall to the south. The area is intersected by minor depressions which form natural drainage lines, and, as far as possible, the drainage system has been designed to follow these depressions.

The area is reasonably flat and even and considered suitable for irrigation by furrow or border check methods. It is not anticipated that there will be any flooding of the area from the Balonne River, even with peak floods of similar magnitude to that of 1950.

Land Use.

Existing Land Use.

Present land use in the area is for wool production. During flush seasons some grazing of cattle is practised but wool production still predominates.

Proposed Land Use.

In planning development of the area, it has been assumed that ultimately its prime function will be wool and fat lamb production from irrigated pastures.

Each settler will be free to select the type of production he considers most suitable, but it has been assumed in this report that initially farms will be developed on a cotton-fodder production basis with wheat and a small number of sheep as a sideline. Ultimately it is felt that farms may turn to fat lamb and wool production and provision for such has been made in fixing farm sizes.

For cotton-fodder production the annual land utilisation under irrigation has been assumed as 40 acres for cotton, 42 acres perennial pastures, and one irrigation of fallow for 100 acres of wheat. For fat-lamb and wool production annual land utilisation under irrigation is expected to be about 115 acres—75 acres under annual pastures and 40 under perennial pastures.

Farm Sizes and Water Allocation.

In determining farm sizes, allowance has been made for ultimate development on wool and fat-lambs production. The gross area of each farm has been fixed at 300 acres, which is considered suitable for this form of production under irrigation.

It is proposed that a water right of 140 acre feet be allotted to each farm with allowance for the supply of an additional 30 per cent. as sales, thus setting the total water supplied to any farm in a normal year at 182 acre feet.

Water Requirements.

Annual water requirements for the various types of plantings are estimated to be—

Perennial Pastures and Lucerne	30 inches per acre.
Annual Pastures	13 inches per acre.
Cotton	15 inches per acre.
Wheat	3 inches per acre.

Table 7 shows the estimated monthly water requirement of perennial pastures, lucerne, and cotton, and also the monthly percentage of the yearly requirement—these are less than the requirements for maximum plant growth as shown in Table 5, but it is considered that these amounts are sufficient to provide the most economical return for water used.

TABLE 7.
ESTIMATED MONTHLY IRRIGATION DEMAND.

Month.	Monthly irrigation demand.			
	Perennial pastures and lucerne.		Cotton.	
	Inches.	Percentage.	Inches.	Percentage.
January	3.9	13	3.1	21
February	3.3	11	4.5	30
March	3.9	13	3.9	26
April	2.4	8	2.1	14
May	1.5	5
June
July
August	2.1	7
September	2.1	7
October	3.3	11
November	3.6	12	0.3	2
December	3.9	13	1.1	7
Totals	30.0	100	15.0	100

The small demands for the months of June and July in normal years have been ignored and a non-irrigation season created for maintenance purposes. In ignoring the demands for these two months, those for May and August have been adjusted accordingly.

In exceptional circumstances, such as drought years, when water may be required during these two months to avert loss of production, the length of the non-irrigation season can be adjusted to suit agricultural requirements.

PART V.—PROPOSED DEVELOPMENT.

Area Commanded.

Table 8 sets out the gross area of farms and gross area covered by the irrigation and drainage works in the two stages. The gross area of farms is considered as being about 80 per cent. of the area covered by the irrigation works, &c., the balance being required for channel, drain, and road reserves and areas of unsuitable topography or soils.

TABLE 8.
NUMBERS OF FARMS AND AREAS COMMANDED.

Stage.	Farms.		Area of farms.	
	No.		Acres.	
1	17		5,100	
2a	12		3,600	
2b	20		6,000	
1 and 2a	29		8,700	
1 and 2b	37		11,100	

Stage Development.

As the construction of the storage works is being carried out in two stages, irrigation development is being planned on similar lines.

Another feature making stage development desirable is the present limited practical experience of water usage and desirable irrigation methods and practice for the area. Following Stage 1 development, some revision of estimated water requirements for particular crops may be found necessary, and can then be readily effected before water is allocated from the increased storage which will be available.

Land Resumptions and Subdivision.

A complete resubdivision will involve almost complete resumption of lands within the area and it is proposed that such resumptions will be carried out under the provisions of the Irrigation Acts. Existing land tenures are shown on Plan No. 3.

Provision has been made in the estimates of capital cost for land resumptions.

Organisation and Method of Settlement.

The proposals submitted in this report summarise a considerable amount of investigation of the engineering and agricultural aspects of the project. However, the ultimate success of the project will depend largely on the settlers who actually take up the land and if these settlers fail through lack of ability, insufficient finance, or inadequate knowledge of irrigation farming methods, the careful and detailed investigation and planning of the engineering and agricultural aspects will have been wasted.

It is, therefore, necessary that the matters of organisation, planning, and methods of settlement be given consideration equal to that given to the other aspects of the project.

Major factors which require attention are—

(i.) Availability of Settlers.

The present demand for land in all parts of Queensland indicates that there is a large number of potential settlers available. Little difficulty is therefore expected in obtaining suitable settlers.

(ii.) Selection of Settlers.

It is recognised that in all types of farming a "good" farmer will frequently succeed where a "poor" farmer under similar circumstances will fail.

In irrigation farming the small farm areas utilised as a result of intensive land use leave little margin for inefficient farm management and thereby emphasise the difference between the good and poor farmer. It will, therefore, be desirable to select only those who, from their experience or general ability, would appear likely to succeed. Provision for such selection is made in opening lands under the Irrigation Acts.

(iii.) Farm Development Works.

(a) As the farms will be developed from virtually "virgin" country, liberal finance to settlers will be necessary to enable early provision of reasonable requirements in respect of buildings, plant, and equipment, fencing, and stock. If the finance made available is unduly limited, development of the area is likely to be seriously retarded and the major reasons for providing irrigation facilities, intensive development, and high production combined with good living standards will be defeated.

(b) To expedite development of the farms and reduce the period of time between entering into occupation and obtaining an adequate return, it is proposed that the Commission, prior to allocation, clear and prepare for irrigation 50 acres of land on each farm. This would ensure that the initial area on each farm is properly prepared for irrigation and enable the settler to utilise this part of the farm immediately he enters into occupation. Adoption of this proposal would also enable such work to be done more economically than would be the case if clearing and land preparation plant is held in the area to carry out the work on demand in small amounts. It is estimated that the cost of this work would not exceed £750 per farm, such cost to be charged against the farm when allotted.

(iv.) Advisory Services.

Intensive land use under irrigation has its own specific problems and considerable assistance to settlers can be provided by the various State Government Departments working in conjunction. As the establishment of an experimental or demonstration farm is not warranted at the present time, consideration should be given to making arrangements with one of the initial settlers to work in close co-operation with the Departments in the holding of regular field days at which the various irrigation and agricultural aspects can be demonstrated and explained to the other settlers.

(v.) Machinery Pool.

In order to assist settlers in the early stages of development when it is expected they will experience difficulty in obtaining finance, it is proposed that the Commission establish and operate a pool of machinery for specialised tasks on the farm.

The machinery which it is proposed to include is as follows :—

- Land-grading machinery.
- Pick-up hay balers.
- Header harvesters.

Urban Centre.

The town of St. George will provide the goods and services needed by the farmers and their families and also possesses good recreation facilities. St. George is connected by an all-weather highway to the railhead at Thallon on the South-Western Railway.

Roads.

Development of a road system throughout the area to reasonable pioneer standards will be required to allow access to farms as well as providing for the operation and maintenance of the engineering works. The existing St. George-Thallon Highway provides connection with St. George and will serve farms where it passes through the area.

Work required in development of the roads to pioneer standards comprises clearing, grubbing, forming, light surfacing, and drainage. Upon completion of roads to this standard they will be handed over to the Local Authority for further development financed from normal revenue channels.

Provision has been made in the estimate of capital cost for initial development of the new road system.

Electric Power.

Electrical power to operate the pumping station will be available from the St. George Electric Authority.

During 1949 the Commission made arrangements with the Authority, which was then about to increase its generating capacity, to instal further additional capacity to carry the anticipated load from the irrigation pumping station, the additional capital cost to be borne by the irrigation scheme in the form of an annual demand charge.

The annual demand charge is now estimated to be £1,181, and it is considered that it would be preferable to pay the capital cost of the additional capacity, estimated to be £34,000, rather than pay the annual demand charge which would increase the annual operating costs set out in this report.

In view of this, preliminary arrangements have been made with the State Electricity Commission along these lines, pending submission and approval of this report.

In the estimate of capital cost for the project, provision has been made for the payment of £34,000 to extinguish the capital cost of the generating capacity required for the irrigation pumps and no allowance has been made in the estimate of annual cost for the demand charge.

Possible Future Development.

Preliminary investigations made some years ago indicate that with the construction of additional storages on the Balonne River upstream of St. George a considerable increase in the area which could be irrigated would be possible. At this stage it appears that future development could either be by gravity or pumping diversion and that the area which it is proposed to establish under this report could be incorporated with any future development.

It is proposed that further investigations into the extent and location of future development should be undertaken as early as possible.

PART VI.—IRRIGATION WORKS.

The irrigation works comprise a pumping station immediately upstream of the weir lifting the water to the main channel which runs in a direction roughly south-east of St. George to the north-west corner of the area. Reticulation to the farms within the area will be through a system of open earth channels. The proposed location of the irrigation area makes possible a relatively small pumping head compared with that necessary for land immediately adjacent to the river but upstream of the town.

Design.

The main channel and distribution system has been designed for twenty-four (24) hours' watering and of such capacity that a maximum demand of "Water Right in 105 days" can be met.

If a greater demand does occur occasionally for short periods, the channels will be able to pass the larger flow by slightly increasing the depth of water without causing any damage.

Pumping Station.

The pumps to be installed will be electrically driven and designed to operate unattended.

In assessing the required pumping capacity, it has been considered essential to allow for a maximum demand of "Water Right in 90 days" as, compared with the channel system, the pumps will be relatively inflexible and a shortage of pumping capacity for even short periods may seriously jeopardise plantings. This allowance will also ensure that the pumping capacity is adequate if the efficiency of water distribution proves to be less than anticipated.

Details of the pumps for the two stages of development are set out in Table 9. Power requirements have been estimated for an average static head of 30 feet.

TABLE 9.
PUMPING STATION CAPACITIES.

Stage.				Units.				Stage capacity.	Total installed capacity.	
								Cusecs.	Cusecs.	kW.
1	{	1- 6-0 cusecs	22-0	75
					1-16-0 cusecs	22-0	
2a	1-11-0 cusecs	33-0	113
2b	1-19-0 cusecs	41-0	131

Distribution System.

The main channel and reticulation works to the individual farms will be trapezoidal-shaped earth channels. Appurtenant works will include construction of road and occupation crossings, Dethridge meter outlets, regulator, and control structures. All structures will be constructed of reinforced concrete, which has the advantages of strength, durability, and low maintenance costs.

Dethridge meters installed at the point of service to the individual farms provide a means of adequately controlling and measuring the water supplies to each farm. Water charges will be based on such measurements which will also enable each farmer to determine accurately the rate of flow on to, and the total application of water to, his farm, thus providing adequate information to facilitate efficient water usage on the farm.

Channel Efficiencies.

It has been estimated that 70 per cent. of the water pumped will be delivered to the farms, the remaining 30 per cent. being lost by evaporation, seepage, and wastage at overflows.

Capacity of Works.

The total pump capacity in Stage 1 will be 22 cusecs, or 44 acre feet, per day, and at such rate the normal pumping capacity per farm will be 1.3 cusecs, with all farms watering at one time.

In the completed project (Stages 1 and 2b) the total pump capacity is increased to 41 cusecs and the normal pumping capacity per farm reduced to 1.1 cusecs.

On the basis that each farm will be supplied with water on five (5) successive days in each 15, the maximum rate of delivery at the farm, in the completed project, allowing for efficiency of distribution, will be 2.0 cusecs.

PART VII.—DRAINAGE WORKS.

Drainage works are necessary to prevent waterlogging of the soils after periods of heavy rainfall and to remove excess water resulting from inefficient irrigation. The drains will consist of open earth channels located to serve each farm and discharging into adjacent natural depressions.

Design.

The maximum intensity of rainfall in the area for a 10-year frequency is 4 inches in 24 hours and the drains have been designed to discharge the runoff from this amount of rainfall in 48 hours thus allowing ponding on the farms for up to 48 hours.

Structures.

Road and occupation crossings will be of the reinforced concrete slab or concrete pipe culvert type. Drop structures, where necessary, will also be of reinforced concrete with sufficient stone protective work upstream and downstream of the structure to prevent scour. Drain junctions shall be similarly protected to prevent scour. Drainage inlets will be provided to pass water from farm lands to the drains.

Formation of Drainage Area.

It will be necessary for the area to be constituted as a "Drainage Area" in accordance with Part V. of "*The Water Acts, 1926 to 1942.*" so that the drainage system can be properly maintained and rating of the benefited area permitted.

It is proposed that the Commissioner of Irrigation shall be the Board in accordance with section 72 of the Acts.

PART VIII.—CONSTRUCTION AND DEVELOPMENT PROGRAMME.

Based on the information available at present, a tentative construction and development programme has been prepared for the two stages of the scheme.

In determining the programme for construction of irrigation and drainage works, allowance has been made for the necessity of installing portion of the pumping plant and some 6 miles of the main channel before any farms can be opened.

Provided sufficient funds are made available, Stage 1 construction can be completed in two years, with some farms opened in the second year and the balance opened in the succeeding year.

Construction of Stages 1 and 2b can be completed in four years, with additional farms opened in the fourth year, and all farms opened by the end of the fifth year.

It is proposed that farms will be opened in July of each year.

PART IX.—ESTIMATE OF CAPITAL COST.

Storage Works.

Capital cost of the storage works is £120,000 for the weir in Stage 1 and an estimated additional £25,000 and £45,000 for the steel gates in Stages 2a and 2b respectively, making a total cost for Stages 1 and 2a of £145,000 and Stages 1 and 2b of £165,000, exclusive of the combined road bridge, which is being financed from Main Roads Commission funds. Stage 1 construction of the weir has been completed.

Irrigation Works.

Designs and estimates for the irrigation works, based on preliminary survey information, required to serve the area developed in Stage 1 have been prepared and an estimate for Stage 2 made on the unit cost per acre of farm revealed in Stage 1.

A summary of the estimated cost of works, number of farms served, areas commanded, and cost per acre served for each stage of development is set out in Table 10. For convenience the capital cost has been dissected to cover the major phases of the works.

TABLE 10.
CAPITAL COST—IRRIGATION WORKS.
(As at 1st March, 1953.)

Stage.	Number of farms.	Area of farms.	Capital cost.					Cost per acre served.
			Power installation.	Pumping station.	Main channel.	Reticulation works.	Total	
		Acres.	£	£	£	£	£	£
1	17	5,100	34,000	48,500	43,000	32,000	157,500	30.9
1 and 2a ..	29	8,700	34,000	53,000	43,000	55,000	185,000	21.5
1 and 2b ..	37	11,100	34,000	62,000	43,000	70,000	209,000	18.9

Drainage Works.

Designs and estimates for the drainage works in Stage 1 have been prepared. Using the unit cost per acre benefited obtained from this detailed examination, an estimate of the capital cost of drainage works in Stage 2 has been prepared.

Table 11 gives a summary of the estimated capital cost of drainage works, area drained, and cost per acre of area drained.

TABLE 11.
CAPITAL COST—DRAINAGE WORKS.
(As at 1st March, 1953.)

Stage.								Total area of farms drained.	Capital cost.	Cost per acre of farm drained.
								Acres.	£	£
1	5,100	31,000	6.1
1 and 2a	8,700	53,000	6.1
1 and 2b	11,100	68,000	6.1

Ancillary Works.

Allowance has been made in the estimate of capital costs for roads, office and staff accommodation, land resumptions, and surveys, totalling £51,000 for Stage 1, £89,000 for Stages 1 and 2a, and £109,000 for Stages 1 and 2b as at 1st March, 1953.

Summary of Estimates.

The estimates of capital cost are summarised in Table 12.

TABLE 12.

SUMMARY OF ESTIMATED CAPITAL COST.

(As at 1st March, 1953.)

	Stage 1.	Stages 1 and 2a.	Stages 1 and 2b.
	£	£	£
Power Installation	34,000	34,000	34,000
Pumping Station	48,500	53,000	62,000
Main Channel	43,000	43,000	43,000
Reticulation Works	32,000	55,000	70,000
Drainage Works	31,000	53,000	68,000
Office and Staff Accommodation, Road Works, and Land Resumptions, Surveys	51,000	89,000	109,000
Installation of Crest Gates on Jack Taylor Weir	25,000	45,000
Total	239,500	352,000	431,000
Cost per acre served	£47-0	£40-4	£38-8

If the initial cost of the existing weir is added to the total costs, the total estimated costs for Stage 1 and Stages 1 and 2a and b become £359,500, £472,000, and £551,000 respectively, and the cost per acre served £70, £54-3, and £49-6, respectively.

PART X.—ANNUAL COSTS AND REVENUE.

Annual Costs.

Estimates of the annual cost at both stages of development have been prepared. These estimates include operation, maintenance, and management costs for all works. No allowance has been made for interest and redemption charges, it being assumed that these charges will be met by the State.

Revenue.

Estimates of annual revenue have been prepared on the basis of the following charges :—

Water	£2 per acre foot.
Drainage	7s. per acre drained.
Land Rental	2s. 6d. per acre of farm land.

To assist the settlers during the initial years of farm development it is proposed that water charges be graduated over the first three years as set out following :—

First year of farm development $\frac{1}{3}$ of Water Right or actual usage, whichever is greater.
Second year of farm development $\frac{2}{3}$ of Water Right or actual usage, whichever is greater.
Third year of farm development and thereafter Full charges.

The water charge is not sufficient to cover the cost of supplying water, but is considered to be the maximum which can be borne by the settler. Annual revenue from water charges has been calculated on the basis of 171 acre feet (Water Right, plus 22-5 per cent. sales) being supplied in an average year.

Annual costs and revenue are summarised in Table 13.

TABLE 13.

ANNUAL COSTS AND REVENUE.

Stage.	Costs.			Revenue.				Deficit.
	Irrigation works.	Drainage works.	Total.	Water charges.	Drainage charges.	Land rental.	Total.	
	£	£	£	£	£	£	£	£
1	6,960	2,140	9,100	5,840	1,785	635	8,260	840
1 and 2a	11,970	2,650	14,620	9,940	3,045	1,085	14,070	550
1 and 2b	13,580	3,533	17,113	12,680	3,885	1,388	17,953	Cr. 840

PART XI.—BENEFITS FROM AND FINANCE OF PROJECT.

Value of Production.

The average gross value of production from a farm operating on a cotton-fodder basis is estimated at £8,440 per annum. This value of production has been based on—

Cotton—	£
40 acres	2,330
Fodder—	
42 acres	3,890
Wheat—	
100 acres	1,795
Sheep—	
Returns from wool and fat lambs	425
	<u>£8,440</u>

For a farm engaged in wool and fat-lamb production, the annual return from a carrying flock of 800 breeding ewes and fattening some 300 wethers is estimated at £7,000.

Increased Value of Production.

Present utilisation of the area proposed for development is wool production, and the estimated return per acre is £2 per annum, giving a gross value of production of £21,800.

The estimated value of production for each stage is shown in Table 14.

TABLE 14.
VALUE OF INCREASED PRODUCTION.

Stage.	Total value of production.	Value of existing production.	Increased value of production.
	£	£	£
1	143,000	13,000	130,000
1 and 2a	245,000	22,000	223,000
1 and 2b	312,000	28,000	284,000

Return to State and Commonwealth.

In the examination of major projects in Queensland it has been assumed that 40 per cent. of the gross value of increased production, less drainage and water charges, is returned to the Commonwealth and State Governments as indirect revenue.

Adopting this basis, Table 15 sets out the financial positions of the project. The initial cost of the existing weir has not been included in the capital cost for the purpose of this analysis.

TABLE 15.
CAPITAL COST, INCREASED VALUE OF PRODUCTION, AND RETURNS TO STATE AND COMMONWEALTH GOVERNMENTS.

Stage.	Capital cost.	Value of increased production.	Return to State and Commonwealth.			
			Total.	Water and drainage charges.	Indirect.	Percentage on capital cost.
	£	£	£	£	£	
1	239,500	130,000	52,000	7,625	44,375	18.5
1 and 2a	352,000	223,000	89,200	12,985	76,215	21.6
1 and 2b	431,000	284,000	113,600	16,565	97,035	22.5

Finance.

Total Annual Cost and Revenue.

The estimated annual costs and revenue for each stage are set out in Table 16.

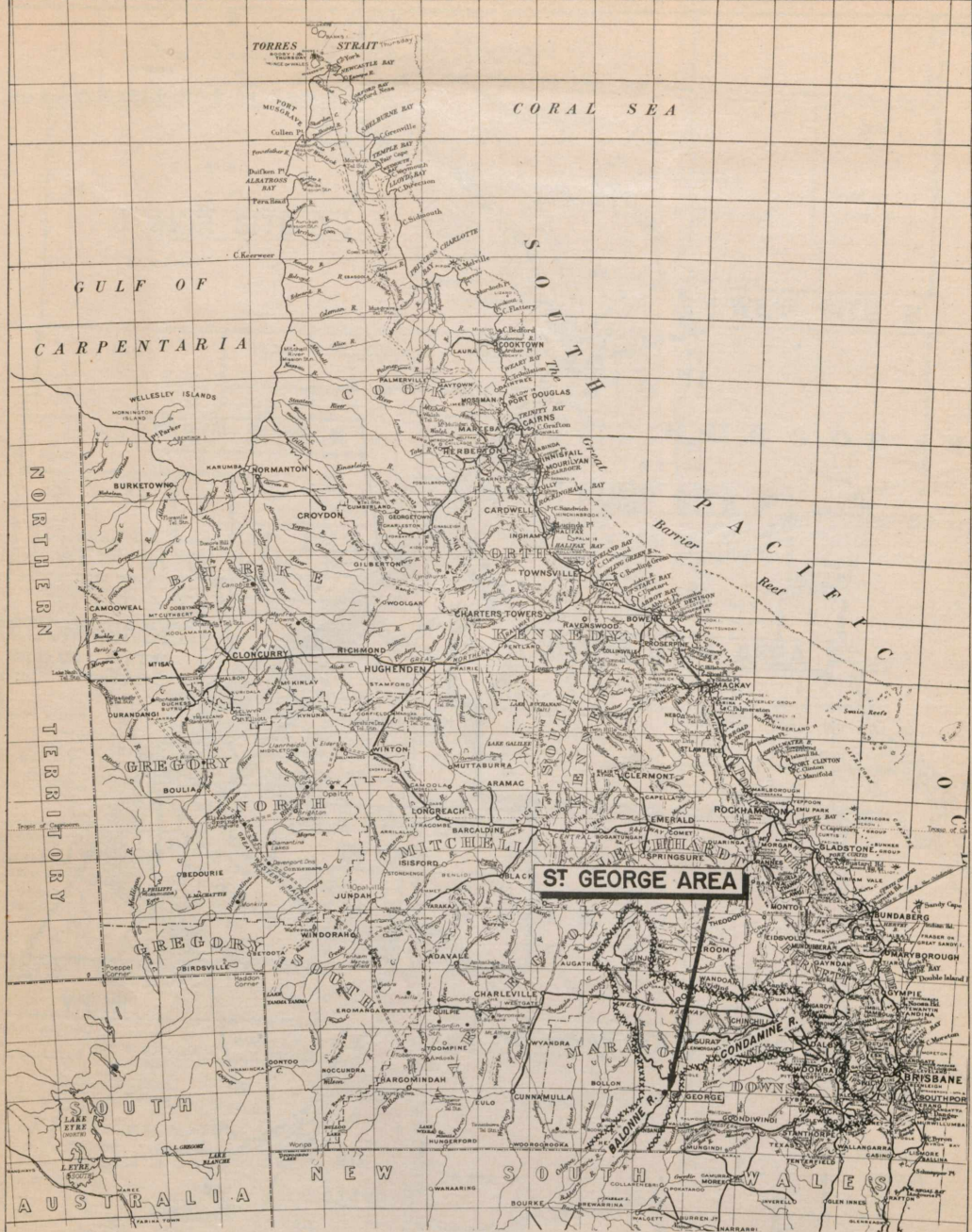
TABLE 16.
TOTAL ANNUAL COSTS AND REVENUE.

Stage.	Annual costs.					Direct revenue irrigation and drainage charges and land rental.	Deficit.	
	Operation, maintenance, and management.	Interest and redemption.*		Total.			Excluding cost of storage works.	Including cost of storage works.
		Storage works.	Other works.	Excluding cost of storage works.	Including cost of storage works.			
	£	£	£	£	£	£	£	
1	9,100	6,300	12,570	21,670	27,970	8,260	19,710	
1 and 2a ..	14,620	7,610	17,170	31,790	39,400	14,070	25,330	
1 and 2b ..	17,113	8,660	20,260	37,373	46,033	17,953	28,080	

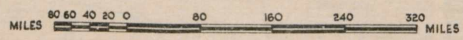
* Interest at 4½ per cent. and redemption over 50 years.

National Works.

Annual revenue from the project will be less than annual costs of operation, maintenance, and management until Stage 2b is completed, and any deficit must be borne by the State Government in addition to all capital charges. This is justified by the value and volume of production which will be available to the community, and the indirect revenue derived as a result of such production.



QUEENSLAND



Boundary of Balonne - Condamine River Basin shown thus xxxxxxxx

IRRIGATION AND WATER SUPPLY COMMISSION

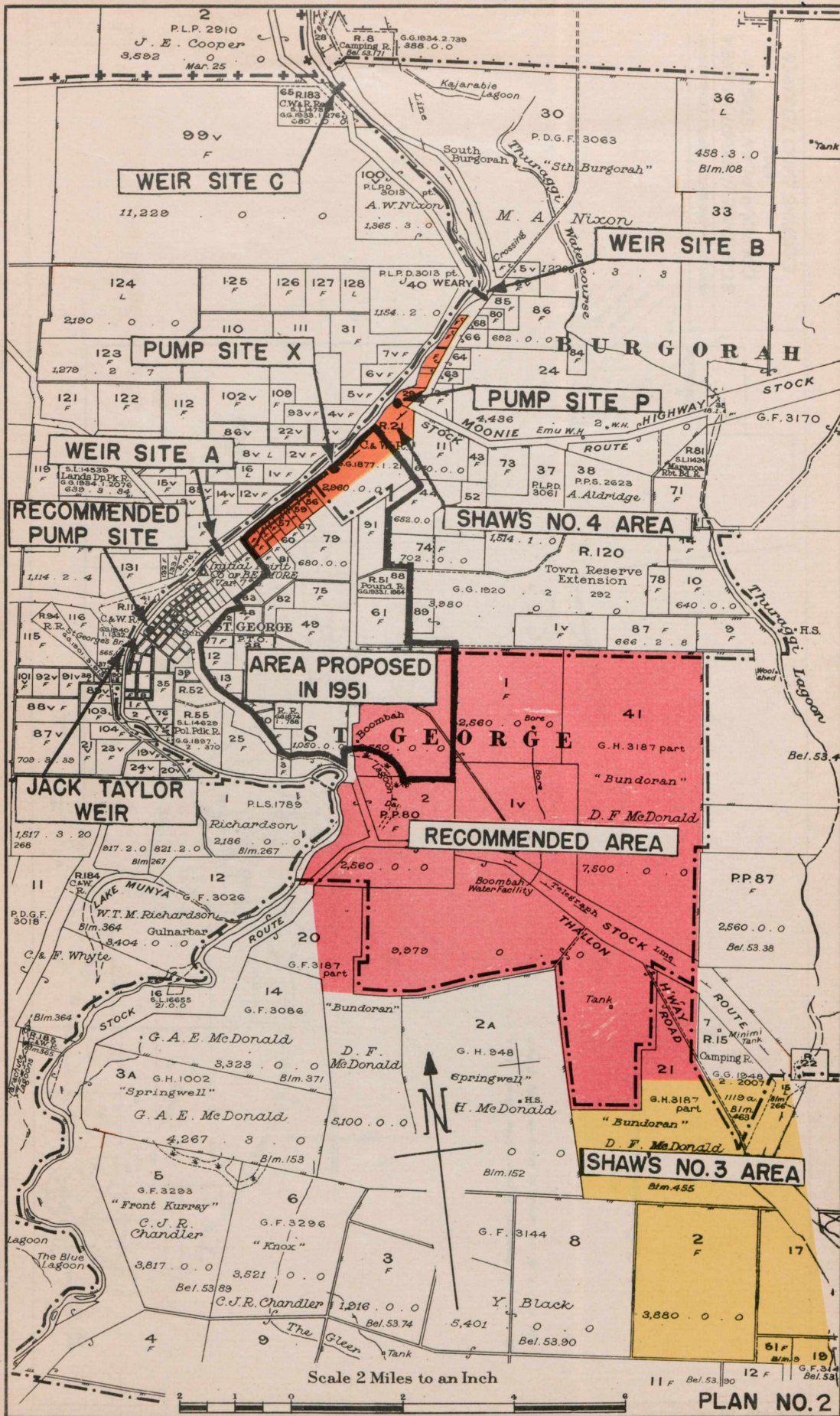
ST GEORGE IRRIGATION AREA

GENERAL LOCALITY PLAN

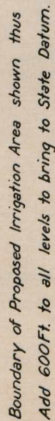
Submitted
G.E. McDowell
Senior Irrigation Eng.

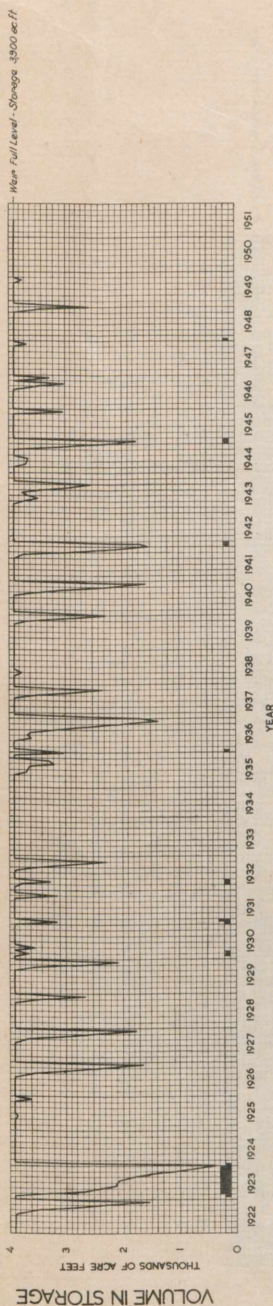
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PLAN No 1

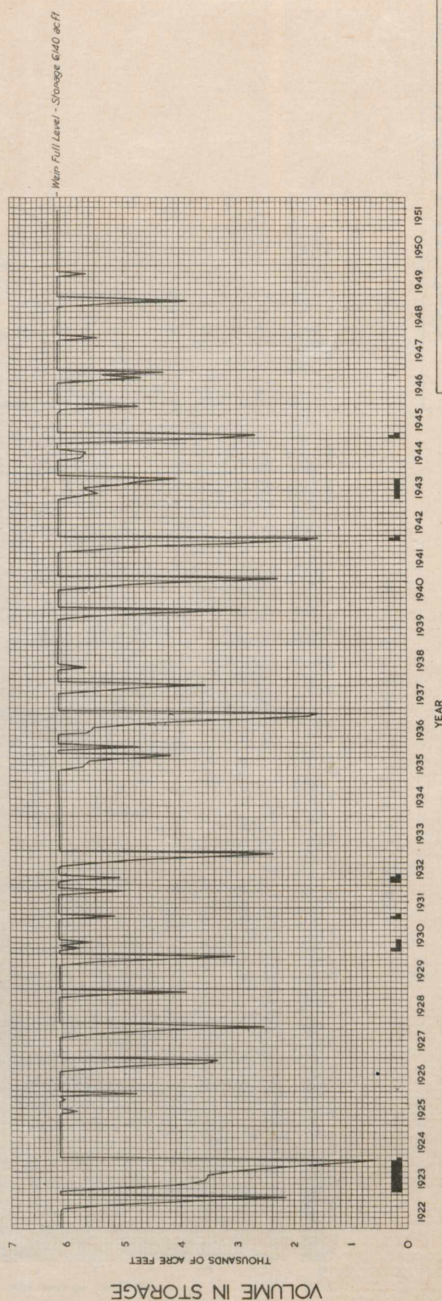


PLAN № 3





STAGE I. WEIR CREST R.L. 630.



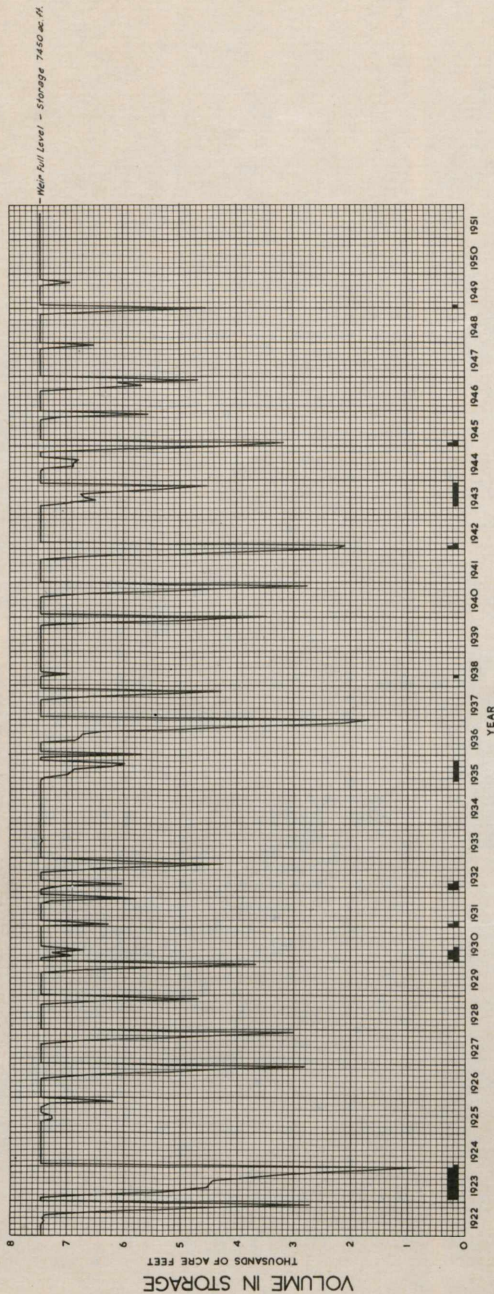
STAGES I & 2dWEIR CREST RL.634.

Periods during which Water Rights only are available shown thus
 " " " supply is restricted to 80% Water Rights "
 " " " supply is restricted to 130% Water Rights "
 At all other times 130% Water Rights are available (i.e. Water Rights + 30% Sales)

IRRIGATION AND WATER SUPPLY COMMISSION

ST. GEORGE IRRIGATION AREA
JACK TAYLOR WEIR

PRELIMINARY STORAGE BEHAVIOUR DIAGRAMS



STAGES I & 2b. WEIR CREST R.L. 636

Periods during which Water Rights only are available
 Periods during which supply is restricted to 80% Water Rights
 At all other times 100% Water Rights are available (i.e. Water Rights + 20% Sales)

IRRIGATION AND WATER SUPPLY COMMISSION

ST. GEORGE IRRIGATION AREA

JACK TAYLOR WEIR

PRELIMINARY STORAGE BEHAVIOUR DIAGRAM

